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Date: April 9, 2010

Route To:

Subject: Process for Recommending Extensions of Travel Management Seasonal Closure

To: Forest Supervisor

This letter describes modifications to the process and procedure for preparing a recommendation to the Eldorado National Forest Supervisor regarding whether to issue a Forest Order to close native surface roads and trails beyond the seasonal closure period specified in the Travel Management Record of Decision (ROD). These modifications are based on experience from implementation of the seasonal closure and seasonal closure extension during the 2009 Winter and Spring. The Travel Management ROD calls for a seasonal closure on native surface roads and trails to all highway legal and non-highway legal vehicles between January 1 and March 31 annually. A wet season closure is a tool for protecting native surfaced roads and trails when they are susceptible to rutting¹ and soil damage. Rutting causes direct damage to travelway treads, concentrates runoff that can lead to gully erosion, and leads to trail widening. Wet season use can also damage drainage structures such as rolling dips, waterbars, and other waterbreaks. These structures are easily damaged when soils are too wet. Other key objectives of the wet season closure are to protect the drainage structures from damage and to protect the road or trail tread from rutting and erosion. Also, the closure minimizes impacts to water quality at stream crossings or where drainage off of roads or trails becomes concentrated, carrying sediment and other deleterious materials into stream courses.

In the description of the selected alternative presented in the 2008 Final Environmental Impact Statement, it is stated that “if it is determined by the Forest Supervisor outside of these dates, based on soil moisture evaluations, rainfall, road and trail conditions, and weather forecasts, that areas are not suitable for use, the Forest Supervisor has the authority to close those areas for a specified amount of time using Forest Orders” (FEIS, page 2-11 and 2-7). The FEIS identifies four factors to be considered in determining whether to extend the seasonal closure. Based on a consideration of these four factors, a team will then make a recommendation to the Forest Supervisor whether the established closure period is adequate or an extension is desirable to protect Forest resources. The procedures outlined in this letter are essential because the seasonal closure period of January 1 to March 31, as spelled out in the Travel Management ROD, is based on critically dry years². Statistically there is a 13 percent likelihood of a critically dry year occurring within any water year (October 1 through September 30). Conversely, there is an 87

¹ Rutting is the creation of furrows or grooves in the travel way tread due to vehicle travel on a road or trail when the soil strength cannot support the weight of the vehicle. These ruts commonly occur when the soil and subgrade is saturated, causing the soil strength to be low. Rutting is an undesirable impact. In contrast, compaction of a travel way tread is desirable and helps to create a good running surface in native materials. Compaction is optimal when soil voids are partially filled with water, rather than in a fully saturated condition.

² A critically dry year is defined by the California Department of Water Resources (CDWR) as one in which the annual amount of precipitation is less than 50 percent of the average amount as presented in CDWR Bulletin 120.



percent chance that the forest will not experience a critically dry year which may require an administrative order extending the closure period.

CLARIFICATION OF THE FOUR FACTORS TO BE CONSIDERED

Soil Moisture: The soils of the Eldorado National Forest have highly variable physical properties primarily due to parent material, climate, and age. There are three primary types of soils within the Eldorado National Forest:

- **Granitic Soils:** Soils formed from weathered intrusive igneous rocks are coarse textured with very little clay content, and primarily found in the eastern two-thirds of the forest. They are generally higher elevation soils.
- **Lahar Soils:** These are soils that formed from volcanic ash and mud flows and tend to be medium-textured loams. They are found throughout the forest- generally on ridge tops and tablelands.
- **Metasedimentary Soils:** These soils formed from metamorphosed marine sediment and tend to be fine-textured soils. These soils are generally found on the western one-third of the forest and are characterized by a reddish brown hue when moist.

The metasedimentary soils are the soil type most prone to damage from vehicular traffic during periods of higher soil moisture. The response of any soil to vehicular traffic is primarily governed by the distribution of fine-earth particles in a soil (sand, silt, clay) and the rock content throughout a soil profile. Generally for soils of the Eldorado National Forest, the finer the soil texture, the more prone a soil is to damage from vehicular traffic.

Damage to the road tread is manifested by soil rutting. Generally, rutting causes costly physical damage to the road tread and exacerbates sediment delivery to streams by channelizing flow. Rutting occurs when soil strength is diminished by wetting. As soils become progressively wetter, soil particles become surrounded by moisture films. The moisture film acts as a lubricant and the soil particles are able to slide relative to each other when a load is applied to the soil surface. The more water held within the soil matrix, the more soil strength is reduced and, subsequently, the ability to support a load is reduced.

To determine which soils are most prone to rutting, the soil property “Plasticity Index” was used as a surrogate soil property. According to the Natural Resources Conservation Services (NRCS), the Plasticity Index ... *“is the range of water content in which a soil exhibits the characteristics of a plastic solid.”* When a soil is in a plastic state, *“it is capable of being molded or deformed continuously and permanently, by relatively moderate pressure, into various shapes”* (Soil Science Society of America 2001). When a road is being rutted, plastic deformation is occurring. A high “Plasticity Index” is the soil characteristic best suited to predict where rutting will be most problematic³.

³ ArcGIS 9.2 was used to spatially group soils on the Eldorado National Forest with the highest Plasticity Index. The data was acquired using spatial and tabular data from the NRCS Soil Data Mart [ONLINE: <http://soildatamart.nrcs.usda.gov/>].

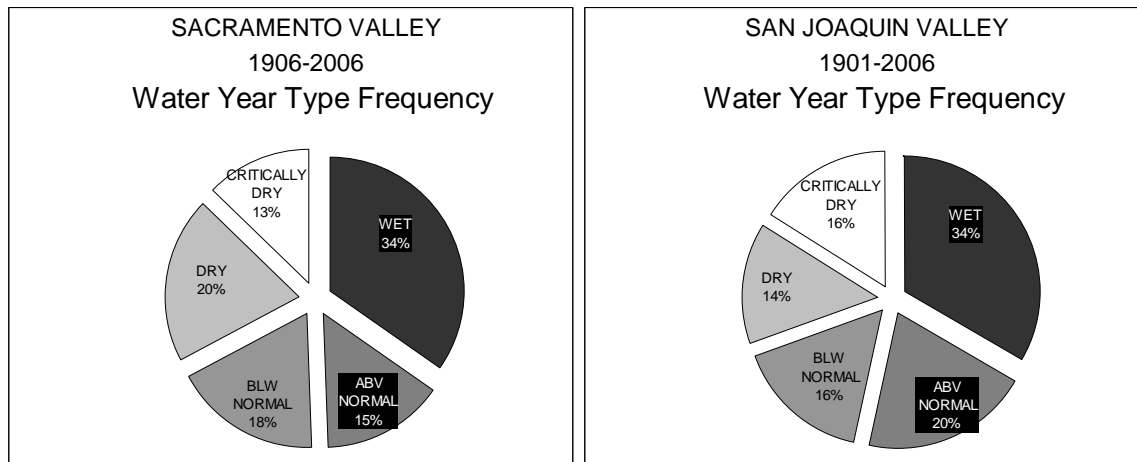
The Soil Scientist and the Road Manager, using best professional judgment as informed by field conditions, will assess soil moisture in native surface roads within areas of higher plasticity, as described above. They will generally base a recommendation on review of roads with a road surface that has a low coarse fragment content (so it does not significantly increase the load bearing capacity), roads with grades between 2 and 5 percent, and areas with high traffic patterns. Using the field indicators of soil moisture contents listed in Table 1, they will determine if soil is too moist for vehicle traffic and will lead to resource damage. Additional observational information provided by field-going personnel will be considered in making a determination⁴.

During winter rains, soils wet from the surface. Soils become wetter with depth only until the upper parts of a soil become saturated. This zone between wet and dry soil is called the wetting front. The drying front also works vertically through a soil. The lower portions of a soil cannot dry until evaporation has dried the upper-most portions of a soil. To account for these wetting and drying fronts, the soil will not be considered too wet in the fall/winter until the wetting front has exceeded three inches in depth and the soil will not be considered dry enough in the spring until the drying front has reached a depth of three inches. The Soil Scientist will be responsible for sampling to determine an average depth for the wetting and drying front.

Precipitation and Rainfall: Because the interaction between available moisture and soil type determines the potential road and trail tread damage, precipitation patterns also need to be considered. There is considerable variation in average annual precipitation throughout the ENF, but this variation generally follows a pattern. Precipitation patterns generally increase from west to east and from south to north. Precipitation primarily falls as rain on those soils that have the highest plasticity index. North-south precipitation patterns are noticeably different on either side of the Highway 50 corridor. The northern portion of the ENF is situated within the southeastern portion of the Sacramento Valley watershed, whereas the southern portion of the ENF is situated within the San Joaquin Valley watershed. The following figure shows the frequency of the different water year types within these two major drainage systems. The San Joaquin River Watershed, which includes the Cosumnes and NF Mokelumne Rivers and their tributaries, is typically a little drier and warmer than the Sacramento River Watershed (American River and its tributaries). The average annual precipitation in the northern portion of the Forest is 10 inches greater than a similar elevation in the southern portion of the forest. The following figures show the frequency of water year types for the northern portion of the Forest (Sacramento Valley) and the southern portion of the Forest (San Joaquin Valley).

⁴ A form was developed for the 2010 Winter season to allow field-going Forest personnel to provide useful information regarding native surface roads within areas of highly plastic soils.

Frequency of Water Year Types



Data from weather stations within or near areas of high plasticity soils will be reviewed by the Soil Scientist and Road Manager and will be considered in determining when to begin assessment of soil moisture, wetting front depth, and other factors.

Road and Trail Conditions: Roads and trails are constructed and maintained to have functioning water control and drainage structures that allow for water flow to be removed from the road or trail surface before it becomes concentrated and causes erosion and gulying. Following large storm events or under other extenuating circumstances, water drainage structures may become damaged or poorly functioning. In some instances, a road or trail may be impassable or unsafe due to gulying, slipouts, undercut culverts, or other damage. To avoid damage to the road and trail system, and to provide for safe access to the Forest, overall road and trail conditions will be a factor in determining whether to implement or extend a wet weather seasonal closure.

The Road Manager will consider road and trail conditions in making the recommendation on the need to prohibit use of native surface roads or trails until there is a lower likelihood of rutting or other damage. Poorly designed or poorly constructed road and trail segments, such as road segments lacking proper drainage or road segments located adjacent to seasonal seeps, are known to exist and will not be used to represent general conditions when making the recommendation.

The native surfaced roads most susceptible to damage from rutting generally occur in soils within the western portion of the forest (although there are some areas of damage prone soils in the Crystal Basin Area also). The soils in the western portion of the forest dry out much earlier than the soils in the eastern portion, due to the difference in elevation and snow accumulation.

Weather Forecasts: The depth of the wetting front is affected by past precipitation. Forecasted weather trends are also a consideration in predicting changes in the depth of the wetting front and the bearing capacity of the road or trail surface. It is not uncommon to have periods of continuous light or intermittent rainfall, individual intense storms or a series of storms, or

extended periods of dry weather during the normal wet period. Dry periods allow for drying of the soil and improvements in the bearing capacity of road or trail surfaces. Forecasted storms may be the basis for implementing or extending the seasonal closure under conditions that might otherwise not warrant the need for the closure. Long range weather patterns and shorter term weather forecasts will be monitored to help the team assess if predicted precipitation would change the drying trend of the soil or to significantly wet the soil.

RECOMMENDATION TO THE FOREST SUPERVISOR

Using the four factors described above, a team consisting of the Soil Scientist, Road Manager, Forest Engineer, Public Affairs Officer, Recreation Officer, Patrol Captain, Resource Officer and District Rangers will provide a recommendation to the Forest Supervisor. In the spring, this recommendation will be made no more than one week prior to the end of the seasonal closure period or any extensions, in order to reduce the ambiguity associated with weather forecasts and current conditions. In the fall this recommendation will be based on the precipitation the Forest has received and weather forecasts, and any resulting extension will be monitored using the same time frame. It is anticipated that the recommendation will be based on conditions within the majority of the area of soils most susceptible to damage. It is impractical to maintain the seasonal closure until all of the roads and trails are suitable for vehicle travel. The Forest will continue to inform visitors that they are responsible for ensuring that their actions do not cause resource damage

/s/ John M. Sherman
JOHN M. SHERMAN
Forest Engineer

I concur:

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RAMIRO VILLALVAZO
Forest Supervisor

DATE

Table 1 Qualitative field indicators of soil moisture content by soil texture group. This table predicts soil types and moisture contents most susceptible to rutting, and is modified from Poff, 2001 Appendix 8.

Soil Moisture Content	Coarse Soils*	Light Soils	Medium Soils <35% clay	Heavy Soils >35% clay
	<i>Sands, Loamy Sands, and Very Coarse Sandy Loams</i>	<i>Coarse, Medium, and Fine Sandy Loams</i>	<i>VF Sandy loam, Loam, Silt Loam, Sandy Clay Loam, Light Clay Loam</i>	<i>Heavy Clay Loam, Silty Clay Loam, Sandy Clay, Clay</i>
Dry	loose, single grained; flows through fingers	loose; flows through fingers	powdery; sometimes slightly crusted but breaks down into powder	hard, baked, cracked; sometimes has loose crumbs on surface
Slightly Moist	still appears dry; will not form a ball with pressure	still appears dry; will not form a ball with pressure	somewhat crumbly, but ball holds together after release	somewhat pliable; forms a ball under pressure
Moist	still appears dry, will not form a ball with pressure	tends to form ball with pressure, but ball seldom holds together	forms a ball and is very pliable; slicks readily if high in clay	easily ribbons out between fingers; has a slick feeling
Very Moist	tends to stick together slightly; sometimes forms a very weak ball	forms a weak ball with pressure; ball breaks easily; will not slick	forms a ball and is very pliable; slicks readily if high in clay	easily ribbons out between fingers; has a slick feeling
Wet	free water may appear on squeezing; wet outline is left on hand	free water may appear on squeezing; wet outline is left on hand	can squeeze out free water; wet outline is left on hand	puddles and free water forms on surface; wet outline is left on hand

	moisture level suitable for compaction, may be prone to rutting
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	moisture level marginally suitable for compaction, too dry for rutting
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	soil too dry or too wet for compaction
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	moisture level predicted to be ideal for rutting
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REFERENCES

Natural Resource Conservation Service, 2009, National Soil Survey Handbook, Part 618, Definitions (618.45). <http://soils.usda.gov/technical/handbook/contents/part618.html>
Website accessed March 16, 2009

Poff, R., T. Ryan. 2001, A Field Evaluation of the Use of Small Trail Tractors to Maintain and Construct OHV Trails on National Forests in California. Natural Resources Professional Services Contract 53-91S8-NRM-08 Natural Resources Management Corporation, Prime Contractor

Soil Science Society of America. 2001. Glossary of Soil Science Terms. , Soil Science Society of America, Madison, WI